

A REVIEW OF NEARCTIC *MERISMUS* WALKER AND *TOXEUMA* WALKER
(HYMENOPTERA: CHALCIDOIDEA: PTEROMALIDAE)

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Abstract.—The genus *Toxeuma* Walker, herein reported for the first time from the Nearctic region, is represented by four new species: *aciculare* Heydon, *aquilonium* Heydon, *gerra* Heydon, and *inopinum* Heydon. The specimen from which *Toxeuma gerra* is described was reported as *Merismus rufipes* Walker in the Nearctic, but this is a misidentification and the record should be eliminated. However, the Palearctic species *Merismus megapterus* Walker and *M. lasthenes* (Walker) are reported for the first time from the northern Nearctic region. A key to females of Nearctic *Toxeuma* is given.

Key Words: Chalcidoidea, Pteromalidae, *Merismus*, *Toxeuma*, Agromyzidae, Gramineae

The Palearctic species *Merismus rufipes* Walker was first reported in the Nearctic region by Burks (1979). The specimen upon which this record was based is in the collection of the U.S. National Museum of Natural History and represents an undescribed species of *Toxeuma*, a genus not previously known from North America. In this paper we report *Toxeuma* from the Nearctic for the first time and describe four new species. Additionally, we report *Merismus megapterus* Walker and *M. lasthenes* (Walker) for the first time from North America. Both species were previously thought to be restricted to the Palearctic, but the former is widespread in the Nearctic and the latter has been found in Alaska.

This paper is part of a series by the senior author reviewing the Nearctic fauna of the miscogasterine Pteromalidae (Heydon 1988a, b, Heydon and LaBerge 1988). *Toxeuma* and *Merismus* are phenetically similar genera and belong with *Cryptoprymna*

Foerster in a group of miscogasterine genera characterized by the following synapomorphies: 1. The genal concavities extending around one-third of the malar distance. 2. A tendency for the female club to have a large patch of micropilosity. 3. A propodeum which is usually rather elongate (except in *Merismus megapterus*), arched front to back, and with plicae that tend to curve regularly till they converge posteriorly. The plicae in most other closely related genera are initially parallel, and then there is a sharp angle at the point where they begin to converge. *Cryptoprymna* is distinct from *Merismus* and *Toxeuma* by its loss of metallic coloration, its smooth frenum, and elongate hypopygium which extends to the tip of the gaster. *Merismus* and *Toxeuma* retain metallic coloration, a reticulate frenum, and a hypopygium extending less than three-fourths the gastral length. Nearctic *Cryptoprymna* is treated by Heydon (1988a).

The following abbreviations are used for

institutions in the text: BMNH = British Museum (Natural History), London, England; USNM = U.S. National Museum of Natural History, Washington, D.C., U.S.A.; CNC = Canadian National Collection, Ottawa, Canada; SEC = Snow Entomological Collection, University of Kansas, Lawrence, Kansas, U.S.A.; INHS = Illinois Natural History Survey, Champaign, Illinois, U.S.A. Abbreviations used in the descriptions are: LOD = lateral ocellar diameter; OOL = ocelocular line; POL = posterior ocellar line; LOL = lateral ocellar line; F = funicular segment; T = tergal segment (apparent gastral terga, excluding petiole). Body sizes are given as thoracic lengths measured from anterior of pronotal neck to posterior of propodeal nucha; the long petiole of the gaster allows so much flexion that total body length often cannot be measured accurately. Measurements given are units from a Wild 120 unit reticle at 50 \times and can be converted to millimeters by multiplying by 0.02.

Toxeuma Walker

Toxeuma Walker, 1833: 371, 378. Type species: *Toxeuma fuscicornis* Walker. Desig. by Westwood, 1839: 68.

This genus is known from the Palearctic, Neotropical, and Australian regions and was revised in the Palearctic by Graham (1959, 1969) and Dzhankmen (1978). The distribution of world species by regions is as follows (the generic placement of these names was not confirmed and we cite them as currently recognized without attempt at correction): Palearctic: *acilius* (Walker), *discretum* Graham, *fuscicornis* Walker, *mucronatum* Graham, *paludum* Graham, *subtruncatum* Graham; Neotropical: *aphareus* (Walker), *faceta* Girault, *orobia* (Walker); Oriental: *affinis* Ashmead, *ferrugineipes* Ashmead, *hawaiiensis* Ashmead, *nigrocyanea* Ashmead, *nubilipennis* Ashmead, *tarsata* Ashmead; Australian: *pax* Girault. To this list we add the four new Nearctic species described below.

The only biological record is for *T. fusc-*

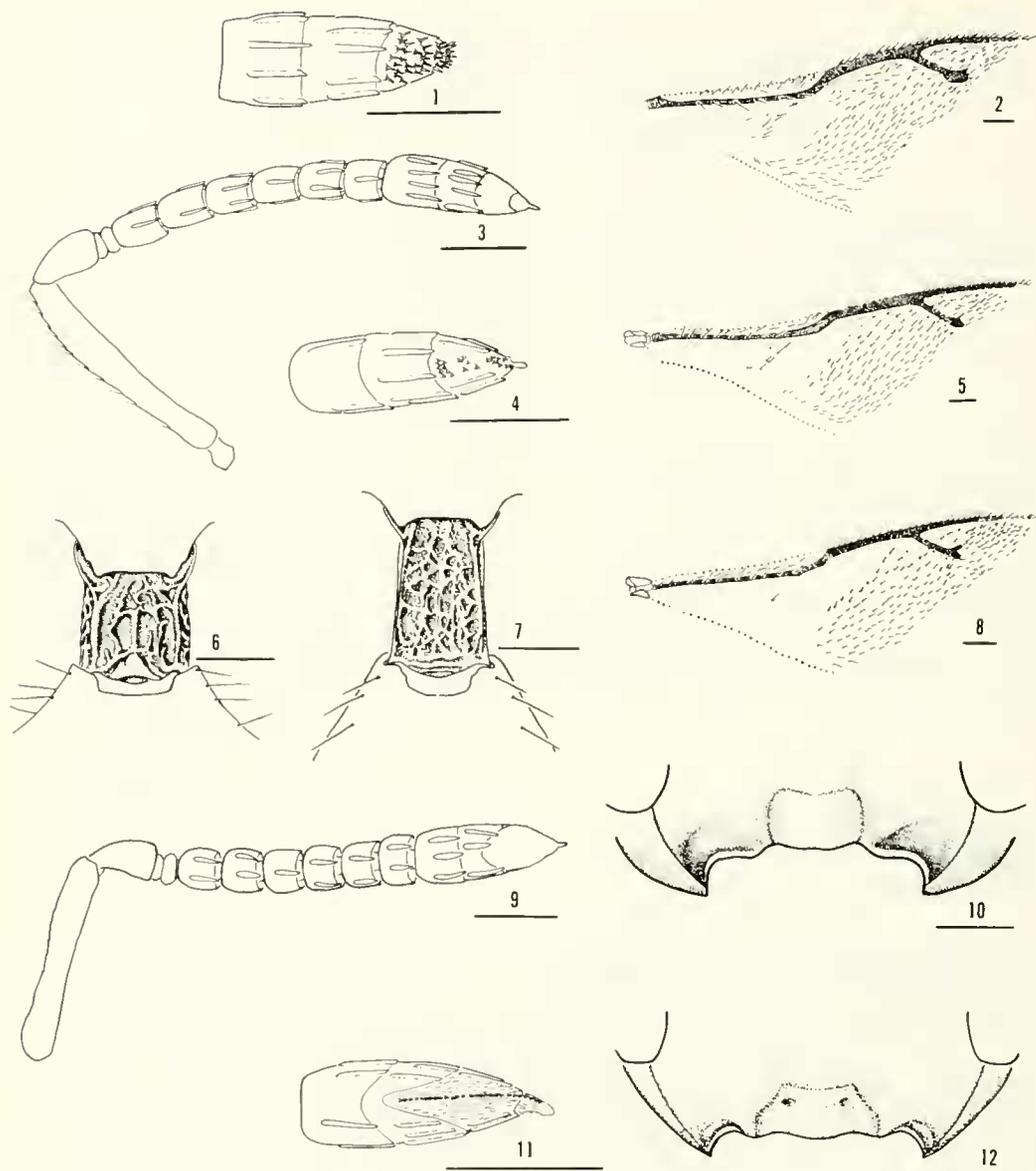
cicornis, which was reared from seeds of *Avena* (Graham 1969); the actual insect host within the seeds is unknown.

The genus *Toxeuma* may be recognized as follows: body metallic green or blue; clypeus with anterior margin straight, lacking denticles (Figs. 10, 12); gena with distinct hollow above mandible (Fig. 10) except in *T. gerra* (Fig. 12); antennal formula 1:1:2:6:3, female club with (Fig. 11) or without large ventral patch of micropilosity and apical spine sometimes present (Figs. 4, 11); pronotum with collar with sharp anterior transverse carina; notauli complete, furrow-like; prepectus reticulate, without carinae; scutellum with 2 or 3 pairs of lateral setae, frenum set off by punctate sulcus; propodeum with median carina and plicae, usually also with weak rugae; gastral petiole reticulate, transverse to elongate, with basal flange laterally and ventrally, lateral longitudinal carinae present (Figs. 6, 7) except in *T. mucronatum*; gaster fusiform or lanceolate; T1 often nearly covering dorsum of gaster, hind margin straight mesally and laterally. Characters to differentiate *Merismus* from *Toxeuma* are listed under the former genus.

KEY TO FEMALE NEARCTIC *TOXEUMA*

The following key will separate females of the Nearctic species of *Toxeuma*. Males of *T. gerra* are unknown. Because males have a simple apical club segment (no spine or micropilosity) and vary in color and wing setation patterns, it is not possible to provide reliable characters to identify unassociated males at this time.

1. Antennal club with terminal spine (Figs. 4, 9, 11) 2
- Antennal club rounded apically, lacking terminal spine (Fig. 1)
 *aquilonium* Heydon, new species
2. Club with needle-like spine at apex (Figs. 4, 9); basal vein with 1-7 setae (rarely bare) (Figs. 5, 8); gena with distinct hollow extending $\frac{1}{4}$ to $\frac{1}{3}$ malar length (Fig. 10) 3
- Club with conical spine at apex (Fig. 11); basal vein bare; genal hollow obscure, extending $\frac{1}{2}$ malar length (Fig. 12) . *gerra* Heydon, new species



Figs. 1-12. 1-2, *Toxeuma aquilonium* n. sp., female. 1, Club. 2, Forewing. 3-6, *Toxeuma inopinum* n. sp., female. 3, Antenna. 4, Club. 5, Forewing. 6, Petiole. 7-10, *Toxeuma aciculare* n. sp., female. 7, Petiole. 8, Forewing. 9, Antenna. 10, Clypeus and lower face. 11-12, *Toxeuma gerra* n. sp., female. 11, Club. 12, Clypeus and lower face. Scale bar = 0.1 mm.

3. Funicular segments 1-3 elongate (Fig. 3); gas-
tral petiole as long as wide (Fig. 6)
..... *inopinum* Heydon, new species
- Funicular segments 1-3 quadrate (Fig. 9); gas-
tral petiole 1.5-2.0× as long as wide (Fig. 7)
..... *aciculare* Heydon, new species

Toxeuma aciculare Heydon,
NEW SPECIES
Figs. 7-10

Holotype female.—Thoracic length 0.90
mm. Body and coxae dark green except: oc-

ciput, neck of pronotum, and gastral terga after T1 darker, almost black; mandibles dark reddish brown with teeth reddish; legs beyond coxae yellow-brown, mid- and hind tarsi cream, pretarsi dark; antenna brown with basal $\frac{2}{3}$ of scape yellow-brown; wing veins translucent brown. Head subreticulate with clypeus microalutaceous; thorax reticulate except pronotum with smooth band along hind margin (length equal to median length of collar), and frenum subreticulate; propodeum with region between plicae reticulate with some rugae, nucha subreticulate; petiole rugulose between irregular longitudinal carinae; gastral terga smooth. Head ovate in anterior view, $1.2\times$ as wide as high (29.5:25), $2.0\times$ as wide as long (29.5:15); occiput moderately concave; clypeus with anterior margin produced, anterior tentorial pits obscure; anterior margins of face laterad of clypeus produced (Fig. 10); gena with hollow extending almost $\frac{1}{3}$ malar length (1.5:5.5); toruli 1 diameter above lower eye margin (2:2); intermalar distance $3.1\times$ malar length (17:5.5); eye height $2.7\times$ malar length (15:5.5); ratio of LOD:OOL:POL:LOL as 3:4:7:4; antenna with pedicel plus flagellum $1.0\times$ head width (30:29.5), ratio of lengths of scape : pedicel : annelli 1 + 2 : funicular segments 1–6 : club as 13:4:1:2.5:2.5:3:2.5:2.5:8.5, funicular segments 1 and 6 both $0.91\times$ as long as wide (2.5:2.75) (Fig. 9), apical segment of club with subterminal needle-like spine and patch of micropilosity ventrally, ratio of ventral lengths of basal : second club segments 1.25 (2.5:2). Thorax with propodeum shorter than scutellum (11:14), nucha set-off by low carina anteriorly. Forewing with ratio of submarginal : marginal : postmarginal : stigmal veins as 38:15:12:7; basal vein with 2 setae on right wing and 1 on left; basal cell bare; costal cell with 1 complete ventral row of setae (Fig. 8). Petiole $1.8\times$ as long as wide (9:5) (Fig. 7), median and sublateral carinae weakly developed. Gaster ovate, $1.6\times$ as long as wide (32:20), basal tergum $0.75\times$ median length (24:32), a row of 3 setae distal to each pos-

terolateral corner of basal fovea; T3–6 retracted beneath T2.

Allotype male.—Thoracic length 0.90 mm. Similar to female except generally light green; thorax with strong golden reflections; mid- and hind femora darkly pigmented over most of length, mid-tibia with dark band on basal third; antenna with pedicel plus flagellum $1.2\times$ head width (35:28), ratio scape : pedicel : annelli 1 + 2 : funicular segments 1–6 : club as 11:4:1:3.5:3.5:3.5:3:3:10, funicular segments decreasing from longer than wide (F1 $1.4\times$ as long as wide, 3.5:2.5) to as wide as long (F6 3:3); ratio of gaster length : width as 26:16, T1 $0.80\times$ median length (20:25).

Type material.—Holotype ♀, Illinois, Champaign Co., Champaign (from railroad siding at the end of Gerty Street on the South Farms of the University of Illinois), 26-V-1985, S. L. Heydon. Allotype ♂, 2 ♀ and 17 ♂ paratypes with same data. Additional 24 paratypes as follows.—CANADA: *New Brunswick*: Fredricton (Acadia Field Station), 13-VII-1970, 1 ♀; Kouchibouguac National Park, 5-VIII-1977, 2 ♀; 16-VII-1977, 2 ♂. *Ontario*: Innisville, 16-VII-1963, 2 ♀, 18-VII-1962, 1 ♀. *Quebec*: Cap Rouge, 4-VII-1956, 1 ♀; 7-VII-1953, 1 ♀. UNITED STATES: *Illinois*: same data as holotype except 19-V-1985, 2 ♀, 1 ♂; 8-VI-1985, 4 ♀, 1 ♂; 19-VI-1985, 3 ♀; 21-VI-1985, 1 ♂; 22-VI-1985, 5 ♀; 24-VI-1985, 1 ♀; 21-VIII-1981, 1 ♀. *Michigan*, Iron Co., 27-VIII-1952, 1 ♀. Holotype female, allotype male, and paratypes in USNM. Additional paratypes in BMNH, CNC, and INHS.

Etymology.—The species name is derived from the Latin *acicularis*—like a needle—referring to the needle-like process on the tip of the female antenna.

Variation.—In females, the body varies from green to dark green to blue-green. The topotypic females nearly all have dark green bodies, only a couple being more blue-green. However, about half the females from Canada are blue-green. The scape varies from completely pale to brownish with a trace of

metallic coloration over the apical half. Femora are always pale. The thoracic length varies between 0.62 and 0.90 mm. The basal funicular segments are rarely slightly longer than wide (2.5:2) but F3 is always quadrate. The petiole varies from 1.4× to 2.0× as long as wide (\bar{x} = 1.56, n = 10). One specimen does not have gastral terga 3–6 retracted beneath T1 and T2. In males, which were all collected from the type-locality, the dark bands on the femora and tibiae may be strongly or only faintly developed, the scape may be entirely dark or pale, the gold reflections of the thorax may not be visible and there may be some setae in the basal cell. The thoracic length varies between 0.70 and 0.86 mm. In most specimens, all funicular segments are longer than wide. In both sexes, the number of setae on the basal vein varies from 0–5 but 84% of female wings examined had between 1 and 3 setae (n = 20).

Discussion.—*Toxexuma aciculare* closely resembles *inopinum* in having the nucha set off anteriorly by a fine carina and having a small area of micropilosity ventrally and needle-like subterminal spine on the apical club segment of the female antenna. These species are readily separated by characters given in the key and also because *aciculare* almost never has setae in the basal cell while *inopinum* almost always does. The eye height is generally more than 2.5× the malar length in *aciculare* while the eye height is less than this in *inopinum*. The scape of *T. aquilonium* is always strongly metallic, and though the scape of *T. aciculare* is rarely brown for half its length, even then, it has only a trace of metallic coloration. The Palearctic species, *T. mucronatum* Graham has a terminal spine on the antennal club, but differs from all such Nearctic *Toxexuma* species in having no rugae on the propodeum, and the petiole uniformly cylindrical and reticulate. In Nearctic *Toxexuma* species, the petiole always has a pair of distinct lateral carinae and it usually has rugae dorsally.

Toxexuma aquilonium Heydon,

NEW SPECIES

Figs. 1–2

Holotype female.—Thoracic length 1.0 mm. Body and coxae blue-green except: frons and discs of mesoscutum and scutellum which are green, occiput and neck of pronotum dark; mandible yellowish brown; legs yellow with fore and hind tibiae with brown bands basally, pretarsi brown; antenna brown with scape metallic blue-green; wing veins translucent brown; setae of body reddish brown. Sculpture similar to *T. aciculare* except face and frenum alutaceous. Head 1.2× as wide as high (28:22.5), 2.0× as wide as long (28:14); clypeus with anterior margin truncate, tentorial pits obscure; anterior margin of face laterad of clypeus not produced; genal hollow extending $\frac{1}{5}$ malar length (1:5); toruli a little over 1 diameter above lower eye margin (2:1.5); intermalar distance 3.2× malar length (17:5); eye height 2.7× malar length (14.5:5); ratio of LOD:OOL:POL:LOL as 2.5:3.75:6.25:3; antenna with pedicel plus flagellum 1.1× head width (30.5:28), ratio of lengths of scape:pedicel:annelli 1 + 2:funicular segments 1–6:club as 13.5:4:1:2.5:3:3:3:2.5:8.5, F1 1.1× as long as wide (2.5:2.25), F6 0.71× as long as wide (2.5:3.5), apical segment of club without spine but with patch of micropilosity on ventral surface, ratio of ventral lengths of basal:second club segments 1.7 (5:3) (Fig. 1). Thorax having propodeum almost as long as scutellum (11:12), costulae distinct, nucha acarinate anteriorly. Forewing with ratio of submarginal:marginal:postmarginal:stigmatal veins as 27:16:15:8, basal vein with 3 setae on left wing and 5 on right, basal cell with 2 setae, costal cell with 1 complete row of setae and partial second row apically (Fig. 2). Petiole 1.5× as long as wide (6:4), with complete median carina, a pair of lateral carinae basally which converge with the median carina basally, and a pair of short sublateral carinae apically. Gaster fusiliform, 1.7× as long as wide

(32.5:19), T1 extending $0.6 \times$ median length, 2 setae present distal to each posterolateral corner of basal fovea, all terga visible, T2–6 with 1 transverse row of setae.

Allotype male.—Thoracic length 0.94 mm. Body blue. Sculpture similar to female. Antenna with pedicel plus flagellum $1.2 \times$ head width (35:28), ratio of scape : pedicel : annelli 1 + 2 : funicular segments 1–6 : club as 11:4:1:4:3.5:3.5:3.75:3.5:3.25:9, all funicular segments elongate (F1 $1.6 \times$ as long as wide (4:2.5), F6 $1.3 \times$ as long as wide (3.25:2.5); basal vein with 2 complete but irregular rows of setae.

Type material.—Holotype female, Alaska, Matanuska Susitna Borough, Matanuska, 12-15-VII-1945, J. C. Chamberlin (Soil emergence cage 118–119, series II, Lot No. 45-19986). Allotype and 1 paratype male same locality, 20-VI-1945, A. Linn (with thrips swept from grass; Lot No. 45-19986). Additional 23 paratypes as follows.—CANADA. *Alberta*: Bilby, 1-VI-1924, 1 ♀. *British Columbia*: Hixon, 11-29-VII-1965, 7 ♀; Kaslo, 1943, 1 ♀. *Ontario*: Ottawa, 27-VI-1982, 1 ♀, 1 ♂; One Sided Lake, 16-VII-1960, 1 ♀. *Quebec*: Laniel, 14-VI-1942, 1 ♀; 8-VII-1944, 1 ♀. *Saskatchewan*: White Fox, 7-VII-1944, 1 ♀. UNITED STATES *Alaska*: Kenai-Cook Inlet, Kenai Peninsula, 1 mi. S Jct. Hwy. #4 and Homer Road, 30-VI-1957, F. W. Preston, 5 ♂. *Colorado*: Doolittle Ranch (Near Mt. Evans), 23-VIII-1961, 1 ♀. *New Mexico*: Lincoln National Forest, 26-30-VII-1977, 3 ♀, 2 ♂. Holotype, allotype, and paratypes in USNM. Additional paratypes in CNC, INHS, and SEC.

Etymology.—The species name is derived from the Latin *aquilonium*, meaning northerly.

Variation.—The females from Kaslo, British Columbia; Colorado; and Saskatchewan lack the dark bands on the legs, but still have the scape nearly totally metallic. The number of setae in the basal cell varies between 0 and 6, with 17 of 23 wings having at least 1 and 10 having at least 2. The petiole varies from as long as wide to 1.4 times

as long as wide ($\bar{x} = 1.24$, $n = 10$). The amount of telescoping of the gastral terga depends on the method of drying. Most terga are retracted beneath T1 in air-dried specimens. The allotype male has a quadrate petiole while the other male paratypes have elongate petioles. The other male from Matanuska has broken antennae and therefore was not selected as the allotype.

Discussion.—Females of *aquilonium* are distinct from those of the other three Nearctic species of *Toxeuma* because they lack the apical spine on the clava. Males and females resemble *inopinum* in the pattern of wing setae and closely resemble those *inopinum* from western Canada in color pattern. However, in *aquilonium* the petiole averages longer than wide and the basal flagellar segments are usually transverse or quadrate, whereas the petiole in *inopinum* is as long as wide and the funicular segments are always elongate. The scape is nearly wholly metallic throughout the range of *aquilonium*, while outside western Canada and montane western U.S.A., the scape of *inopinum* is light over at least the basal third. *Toxeuma inopinum* also has setae in the basal cell, but in this species the setae are almost invariably inserted adjacent to those on the basal vein while in *aquilonium* the setae are often inserted at some distance from the basal vein. *Toxeuma aquilonium* would key out to *subtruncatum* in Graham (1969) but differs from this species in having the sides of the pronotal collar distinctly convergent anteriorly in dorsal view.

Toxeuma gerra Heydon,

NEW SPECIES

Figs. 11–12

Merismus rufipes, Burks, 1979: 789; *nec* Walker, 1833: 378. (Misidentification)

Holotype female.—Thoracic length 0.79 mm. Body and coxae blue-green except: occiput and neck of pronotum dark blue, mesoscutum and scutellum green; mandible brown; legs yellow, pretarsi brown; wing

veins translucent brown. Sculpture like *T. aciculare* except face and frenum alutaceous and gastral tergum 7 microalutaceous. Head $1.1\times$ as wide as high (21:19), $1.8\times$ as wide as long (19:12); clypeus with anterior margin produced medially, anterior tentorial pits distinct (Fig. 12); genal hollow narrow, extending $0.14\times$ malar length (1:7) (Fig. 12); face with subantennal tubercle ventrally curving abruptly to meet dorsal edge of clypeus; toruli 1 diameter above lower eye margin (2:2); intermalar distance $3.0\times$ malar length (15:5); eye $2.2\times$ malar length (11.5); ratio of LOD:OOL:POL:LOL as 1.5:4:6:3; antenna with pedicel plus flagellum $1.1\times$ head width (24:21), ratio of lengths of scape : pedicel : anelli 1 + 2 : funicular segments 1-6 : club as 10:3.5:1:2:2:2:2:2:8, F1 $1.1\times$ as long as wide (2:1.75) and F6 $0.8\times$ as long as wide (2:2.5), ratio of flagellar length to head width 1.1 (24:21); apical segment of club with conical terminal spine and ventral patch of micropilosity extending more than halfway to club base, sutures between the club segments strongly oblique (ratio of ventral lengths of second : basal club segments 0.5 (1:2) although dorsal lengths subequal (4:4) (Fig. 11)). Thorax with propodeum shorter than scutellum (7:10), with plicae and mediana carina complete and distinct and with irregular rugae posteriorly, basal foveae smooth and bordered on all sides by carinae, spiracular sulci shallow, nucha collar-like, transversely rugulose with traces of carina anteriorly. Forewing with ratio of submarginal : marginal : postmarginal : stigmal veins as 24:13:8:5, basal cell and vein bare, costal cell with single complete row of setae ventrally. Petiole $1.3\times$ as long as wide (6:4.5), median and sublateral carinae present anteriorly. Gaster ovate; $2.1\times$ as long as wide (29:14); T1 extending $0.75\times$ median length, 2 setae present distal to each posterolateral corner of basal fovea; only posterior margin of T2 and all of T7 visible.

Male.—Unknown.

Type material.—Holotype female, Virginia, Montgomery Co., 21-VIII-1973, J. M.

Beisler (on sedge). One additional paratype female from Nova Scotia, Bridgetown, 17-VIII-1912. Holotype in USNM, paratype in CNC.

Etymology.—The name is from the Latin *gerra*—trifle—referring to the smallness and rareness of this species.

Discussion.—Females of *gerra* have a terminal spine and patch of micropilosity on the club like those of *aciculare* and *inopinum* but the terminal spine is conical not lanceolate and the patch of micropilosity extends more than halfway to the base of the club (Fig. 11). In females of *aciculare* and *inopinum* the patch extends less than halfway to base of the club (Figs. 4, 9). Unique characteristics of females, and possibly males, of this species are the lack of setae on the basal cell and basal vein, the distinct anterior tentorial pits, and narrow genal hollows which extend only $\frac{1}{2}$ genal length.

Toxexuma inopinum Heydon,

NEW SPECIES

Figs. 3-6

Holotype female.—Thoracic length 0.88 mm. Head with face blue-green, frons green, vertex from lateral ocellus and occiput dark blue; thorax with pronotum black except smooth posterior hind margin dark yellow-green, remainder, including coxae, blue-green, propodeum with yellowish reflections; gastral petiole dark blue-green, gaster blue-green with yellowish reflections; mandibles yellow-brown with teeth brownish; legs beyond coxae yellow except pretarsi black and mid- and hind tarsi cream; antenna with scape yellow, remainder dark brown; wing veins pale brown. Sculpture similar to *aciculare*; T2-7 coriarius except for smooth band along hind margin. Head ovate in anterior view, $1.2\times$ as wide as high (29:23.5), $1.9\times$ as wide as long (29:15); occiput concave; clypeus with anterior margin produced, anterior tentorial pits obscure; anterior margins of face just laterad of clyp-

cus not produced; gena with hollow extending $\frac{1}{3}$ malar length (2:6); toruli 1 diameter above lower eye margin (2:2); internalar distance $3.0 \times$ malar length (18:6); eye height $2.3 \times$ malar length (14:6); ratio of LOD:OOL:POL:LOL as 2:5:7.5:3.5; antenna with pedicel plus flagellum $1.1 \times$ head width (31.5:29), ratio of lengths of scape : pedicel : annelli 1 + 2 : funicular segments 1–6 : club as 14:4:1.5:3:3:3:2.5:2.5:2.5:9.5, F1 $1.5 \times$ as long as wide (3:2), F6 $0.83 \times$ as long as wide (2.5:3) (Fig. 3), apical segment of club with subterminal needle-like spine and patch of micropilosity ventrally (Fig. 4), club sutures perpendicular, ratio of ventral lengths of basal : second club segments 1.8 (3.5:2). Thorax with smooth strip along hind margin of pronotal collar extending just over halfway to anterior transverse carina; propodeum as long as scutellum (13:13), nucha bordered anteriorly by fine but sharp carina. Forewing (Fig. 5) with ratio of submarginal : marginal : postmarginal : stigmal veins as 29:17:13:8; basal vein with 3 setae; basal cell with setae near basal vein—2 on right wing, 1 on left; costal cell with 1 complete ventral row of setae. Gastral petiole $1.0 \times$ as long as wide (5.5:5.5) (Fig. 6), median and sublateral carinae weakly developed; gaster ovate, $1.5 \times$ as long as wide (34:22); T1 extending $0.5 \times$ median length of gaster (17:34), slightly produced medially, 2 setae present distal to each posterolateral corner of basal foveae; all terga visible dorsally (specimen prepared in critical point dryer so less telescoping of gastral terga relative to that in air-dried specimens).

Allotype male.—Thoracic length 0.80 mm. Similar to female except face and mesoscutum green, pedicel and flagellum pale brown; antenna with pedicel plus flagellum $1.4 \times$ head width (35:25), ratio scape : pedicel : annelli 1 + 2 : funicular segments 1–6 : club as 12:3.5:1:4:4:3.5:3.5:3.5:3.5:10, F1 $2.0 \times$ as long as wide (4:2), F6 $1.8 \times$ as long (3.5:2); gaster $1.7 \times$ as long as wide (29:17.5), T1 $0.55 \times$ median length of gaster (16:29).

Type material.—Holotype female, Oregon, Benton Co., Mary's Peak (near Corvallis), 15-VIII-1984, M. E. Schauff, E. E. Grissell, roadside meadow. Allotype male and 32 female and 1 male paratypes with same data. Fifteen additional paratypes as follows.—CANADA: *Alberta*: Lethbridge, 26-VI-1956, 1 ♀; McMurray 8-VIII-1943, 1 ♀; 30-VII-1953, 3 ♀. *British Columbia*, Hatzic Lake, 22-20-VII-1953, 4 ♀; Mission City, 26-VII-1953, 1 ♀. *New York*: Whiteface Mountain, 19-VII-1962, 1 ♀, 1 ♂. *New Mexico*: Lincoln National Forest, 28-VII-1977, 1 ♀. *Utah*: Cache Co., Logan, 7-XI-1954 (alfalfa), 1 ♀; *Washington*: San Juan Island Co., Carter's Point on San Juan Island, 23-VII-1944, 1 ♀. Holotype, allotype, and paratypes in USNM. Additional paratypes in BMNH, CNC, and INHS.

Etymology.—The species name is derived from the Latin *inopinus*—unexpected, unlooked for—referring to the discovery of this species after several drafts of this paper had been completed.

Variation.—In females, body color varies from a basic dark blue to dull green with yellowish tints; the scape is sometimes darker in the apical fifth. Females from Alberta, British Columbia, Washington, and Utah have the scape metallic over most of its length, and dark bands on the femora like female *T. aquilonium*. The thoracic length varies between 0.82–0.96 mm. The basal vein has 2–7 setae with 15 of 20 wings examined having 4–6. The basal cell has 0–5 setae with 11 of 20 wings examined having 2 or 3. Generally, in those individuals having 4 or more setae along the basal vein, there is a partial row of setae apically in the cubital cell. The male paratype is a little paler than the allotype and it has strong yellow reflections on the propodeum and gaster.

Discussion.—Females of this species closely resemble those of *aciculare* in structure of club and both sexes in structure of the nucha but can be distinguished by the characters given in the discussion section of

the latter species. Specimens of *inopinum* from western Canada and montane western United States resemble *aquilonium* closely in color. Additional characters to separate these two species are given in the discussion section for the latter species. *Toxeuma inopinum* is unique in generally having the smooth strip along the hind margin of the collar narrow, extending medially only a little more than halfway to the anterior carina.

Merismus Walker

Merismus Walker, 1833: 371, 375. Type species: *Merismus rufipes* Walker. Desig. by Westwood, 1839: 68.

Kentema Delucchi, 1953: 218. Type species: "*Lamprotatus ovatum* Walker" (= *Miscogaster ovata* Walker). Orig. Desig.

Stylomerismus Graham, 1969: 171. Type species: *Merismus (Stylomerismus) rufipes* Walker. Orig. Desig. **New Synonymy.**

Kentema Delucchi was synonymized with *Merismus* by Graham, 1956. The subgenus *Stylomerismus* was created by Graham (1969) to characterize members of the group of species to which *rufipes* belongs, but unfortunately *rufipes* is the type of the genus (and thus subgenus) *Merismus*. Therefore the name *Stylomerismus* is invalid. Boucek (*in litt.*) pointed out to us that *Kentema* would be the valid subgeneric name if one were used, but we believe it is sufficient to recognize the two species-groups proposed by Graham.

With the findings of this paper, the genus *Merismus* is now represented by the following world species (the generic placement of these names is not confirmed and we cite them as they are currently recognized without attempt at correction): Holarctic: *lasthenes* (Walker), *megapterus* Walker; Palearctic: *nitidus* (Walker), *rufipes* Walker, *splendens* Graham; Australian: *scutellaris* Dodd and Girault, *squamosus* Girault. Revisions of Palearctic species have been writ-

ten by Graham (1969), Hedqvist (1974) and Dzhanokmen (1978).

Host records are known only for two Palearctic species, both reared from Agromyzidae: *M. splendens* from *Agromyza albipennis* Meigen (Graham 1969) and *M. megapterus* from *Cerodontha (Poemyza) pygmaea* (Meigen) (Graham 1969), *C. (P.) incisa* (Meigen) (Graham 1969), *C. (P.) pygmaea* on *Deschampsia caespitosa* (Hansson, 1987), and *Cerodontha (Dizigomyza) ireos* Robineau-Devoidy on *Iris pseudacorus* (Hansson 1987). The U.S. National Museum of Natural History houses specimens of *rufipes* reared from "wheat stubble" in France.

Merismus differs from *Toxeuma* in having 3 asymmetrically arranged anterior denticles on the clypeus (Fig. 14); female club with a linear patch of micropilosity (Figs. 19-20); notauli sometimes shallow posteriorly; prepectus smooth, with oblique carina delimiting posterior triangular area; propodeum with median carina and plicae less well developed, usually more rugose; gastral petiole sometimes also with dorsal basal flange (Fig. 20), well developed lateral longitudinal carina absent (Figs. 20, 22); T1 never nearly covering dorsum of gaster.

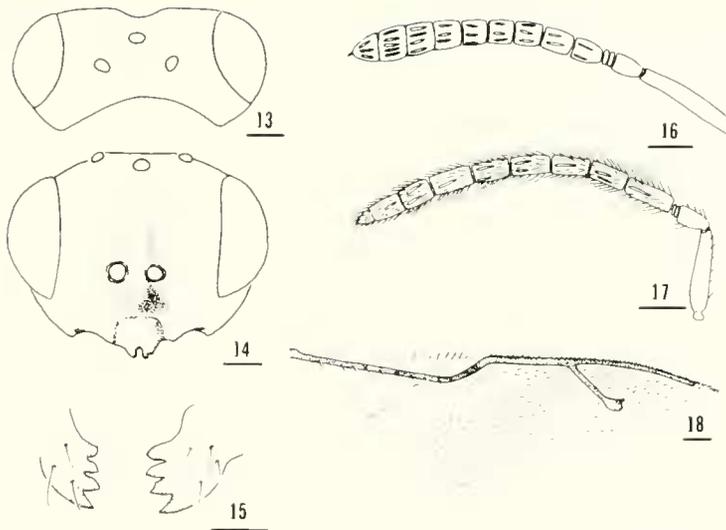
Merismus lasthenes (Walker)

Figs. 13-20

Sphégigaster Lasthenes Walker, 1848: 108, 165-166, ♀. Lectotype, BMNH, examined.

This species was described apparently from one female collected in England and now housed in the British Museum. The only other known specimen of this species was reported by Graham (1969) as a female collected in Scotland. We have discovered a series of 4 female and 7 male specimens collected 30 miles north of Fairbanks, Alaska, 30-VII-13-VIII-1984, by S. and J. Peck from a mixed birchwood forest. These are in the collection of the CNC (except 1 ♀, 2 ♂, USNM).

Although it seems unlikely that the Alas-

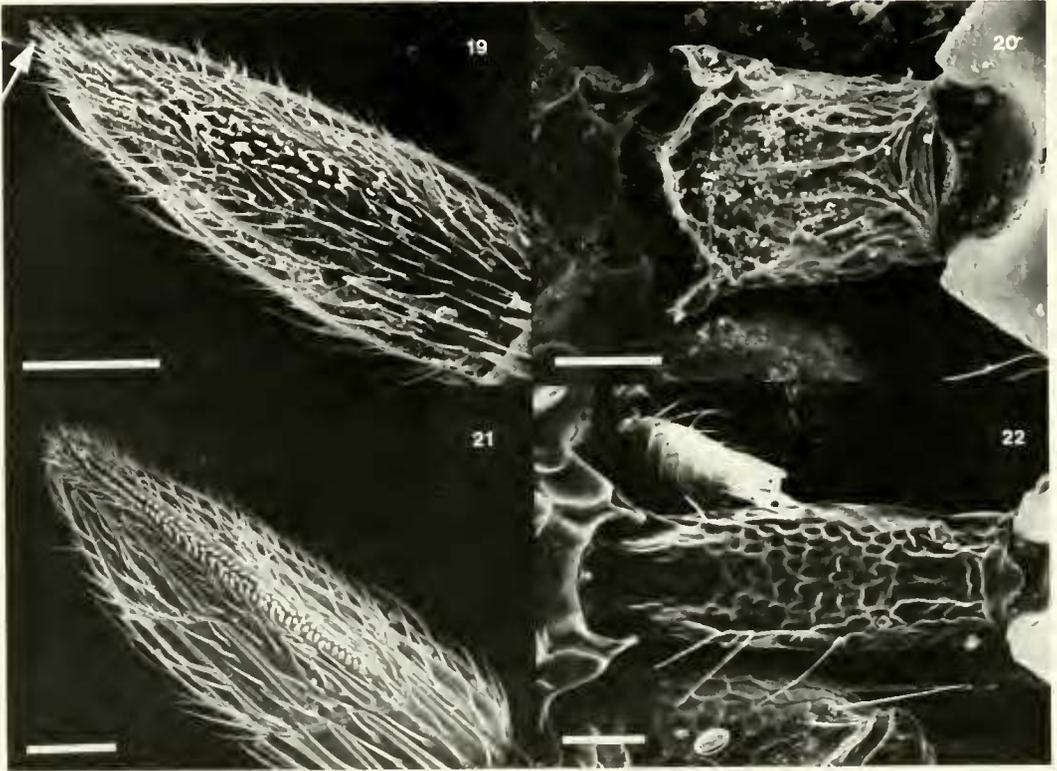


Figs. 13–18. *Merismus lasthenes*. 13. Head, dorsal view, female. 14. Head, anterior view, female. 15. Mandibles, dorsal view, female. 16. Antenna, lateral view, female. 17. Antenna, lateral view, male. 18. Forewing, dorsal view, female. Scale bar = 0.1 mm.

kan specimens would be the same species as the apparently rare British *lasthenes*, we have been unable to find any morphological structures to distinguish the specimens. Measurements as well as superposition of drawings and specimens have given no indication that more than one species is involved. Because the male of this species has never been described and we now can contribute some information on variation in females, we take this opportunity to redescribe the species as follows (the main descriptive sections are based upon the Alaskan specimens; measurements, ratios, and differences for the lectotype female are given in brackets):

Female.—Thoracic length 0.9–1.0 mm [0.9]. Body and coxae blackish metallic green; smoky yellow [to orange] are: basal $\frac{3}{4}$ of scape, tibiae, and tarsi 1–4; mandibles mahogany; wing veins dark brown. Reticulate sculpture fairly uniform on head, thorax, and coxae; gastral petiole faintly reticulate (compared to thorax) and with irregular wrinkles; smooth are: clypeus, posterior margin of pronotum, prepectus, upper mesepimeron, metapleuron, lateral sides of pro-

podeum, dorsellum, and dorsum of nucha; propodeum with irregular median and lateral carinae [no distinct median carina] in addition to reticulation; gastral terga alutaceous. Head in anterior view with interocular distance 1.3–1.4 \times eye height [1.3], in dorsal view 2.1–2.2 \times [2.2] as long as broad, temples converging only slightly and about $\frac{1}{3}$ length of eye (Fig. 13), POL 1.3–1.7 \times length of OOL [1.3], genal hollow *ca.* $\frac{1}{4}$ distance to eye, clypeal apex as in Fig. 14, both mandibles with 4 teeth (Fig. 15), scape barely reaching ventral margin of midocellus, antennal proportions as in Fig. 16, club with ventral area of micropilosity and rows of sensillae on last 2 segments [unknown for lectotype because antenna glued flat to card], apex of club with spine (Fig. 19, arrow). Notauli weakly delimited over posterior third, frenum evenly sculptured much like rest of scutellum, propodeum $\frac{2}{3}$ length of scutellum. Forewing (Fig. 18) with marginal vein 0.9–1.1 \times postmarginal [0.9], apical margin of costal cell with complete setal row on ventral surface but dorsal surface with setal row only in distal half, ventrally also are a few scattered setae distally, basal vein



Figs. 19–22. 19–20, *Merismus lasthenes*, scanning electron micrographs. 19, Club of antenna, ventral view, female (arrow points to apical spine). 20, Gastral petiole, dorsal view, male. 21–22, *Merismus megapterus*, scanning electron micrographs. 21, Club of antenna, ventral view, female. 22, Gastral petiole, dorsal view, male. Scale bar = 0.05 mm.

setose, basal cell with 0 to 1 seta, cubital vein with basal $\frac{2}{3}$ bare and 3 or 4 setae distally, speculum open below. wing surface evenly setose from speculum to apex. Gastral petiole $1.0\text{--}1.2\times$ as long as wide [1.0], flanged dorsally, slightly shorter than propodeum; gaster ovate in outline, $1.4\text{--}1.7\times$ longer than wide [1.5], T1 *ca.* $\frac{1}{4}$ length of gaster and $0.5\text{--}0.7\times$ as long as wide [0.7], T2–7 subequal in length.

Male.—Generally similar to female except as follows: thoracic length $0.8\text{--}0.9$ mm; legs except for coxae entirely straw-yellow; interocular distance $1.2\text{--}1.5\times$ eye height; POL $1.5\text{--}1.8\times$ OOL; antennal proportions as in Fig. 17, no area of micropilosity on venter of club, club without spine at tip but last segment conical and sharply pointed;

marginal vein $0.8\text{--}1.0\times$ postmarginal vein, 0 to 4 setae in basal cell; propodeum varies from nearly completely reticulate with faint rugulosity, to irregularly rugulose with interrupted median carina as in Alaska females, to irregularly rugulose with no median carina as in lectotype female; gastral petiole $1.1\text{--}1.5\times$ as long as broad (Fig. 20), carinate dorsally on distal half; gaster $1.7\text{--}3.0\times$ longer than wide, tending to telescope greatly, T1 *ca.* $\frac{1}{3}$ length of gaster and $0.7\text{--}0.8\times$ as long as wide, T2–7 subequal in length.

Discussion.—Based upon Graham's 1969 key to European *Merismus* and an examination of *rufipes* Walker (lectotype ♀, BMNH), *lasthenes* (Walker) (lectotype ♀, BMNH), and *nitidus* (Walker) (paralecto-

type ♂, 2 additional ♀ and 2 ♂, England, BMNH), *lasthenes* may be separated from other species in the *rufipes* species-group by the 4-toothed mandibles (left 3, right 4 in other species) and the short gastral petiole (1.0 to 1.5× as long as wide and shorter than the propodeum, versus 1.5 to 2.0× as long as wide and equal to the propodeum in other species).

In the Nearctic region, *lasthenes* may be distinguished from *megapterus* by the species-group characters, namely *lasthenes* with gastral petiole flanged (Fig. 20; absent in *megapterus*, Fig. 22), notauli superficial posteriorly (complete in *megapterus*), scutellar frenum evenly reticulate (longitudinally wrinkled with smooth interspaces in *megapterus*), and female with spine on apical tip of club (Fig. 19; absent in *megapterus*, Fig. 21).

Merismus megapterus Walker

Figs. 21–22

Merismus megapterus Walker, 1833: 377.

♂, ♀. Lectotype ♂, paralectotypes, BMNH, examined.

Merismus clavicornis Walker, 1833: 377, ♀.

?*Miscogaster tenuicornis* Walker, 1833: 462, ♀.

Miscogaster ovata Walker, 1833: 462, ♀.

Sphegigaster Agriope Walker, 1848: 108, 165, ♂.

Merismus megalopterus Schulz, 1906: 143 (emendation).

?*Kentema viride* Delucchi, 1955: 94, 96, ♂, ♀.

The above synonymy is taken from Graham (1969) and has not been changed since his work. *Merismus megapterus* has been reported throughout western and central Europe (Boucek 1977). One of us (EEG) first discovered specimens of *megapterus* in material reared and submitted for identification to the Systematic Entomology Laboratory by Dr. Chris Maier (The Connecticut Agricultural Experiment Station, New Haven). Four females and six males emerged in April 1980 from "grass plants" collected in March. These were identified initially using Graham's key (1969) to European *Mer-*

ismus, then compared to specimens identified by Dr. Z. Boucek (Commonwealth Institute of Entomology, London), and finally compared with the type material in 1982. Subsequently a large number of specimens were collected and accumulated by the senior author as part of a study on the miscogasterine pteromalids.

We have seen a total of 38 females and 48 males of this species from eastern Canada and the northern United States (USNM, CNC, INHS, Cornell University, Ithaca, NY). Records from Canada include Quebec, New Brunswick, and Nova Scotia. United States records include (from west to east) California, Washington, North Dakota, Colorado, Texas, Nebraska, Minnesota, Wisconsin, Michigan, Missouri, Illinois, Indiana, New York, Massachusetts, Connecticut, Washington, D.C., Virginia, and West Virginia.

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